

PA.17 Development and Testing of Industrial Scale, Coal Fired Combustion System

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Abstract

The objective of the present effort, which is now complete, was to perform extended duration testing of a 20 MMBtu/hr commercial scale, air-cooled, slagging coal combustor-boiler system. The tests were under conditions that apply to modular, low capital and operating cost coal and solid fuel combustion steam generation plants. Emissions level of 0.2 lb/MMBtu for SO₂, versus a project goal of 0.4 lb/MMBtu, and 0.07 lb/MMBtu for NO_x versus a goal of 0.2 lb/MMBtu were measured.

The initial phase of the project, which focused on combustor durability and automation, was completed in 1993. A total of 262 hours of combustor tests on an oil design, boiler were performed at an industrial plant in Williamsport, PA.

For the final, commercial demonstration test phase, the entire facility was relocated to Philadelphia, PA in 1994. Using prior test results, a second generation, commercial scale, 20 MMBtu/hr combustor was designed, fabricated, and installed. The facility's sub-systems were redesigned to yield optimum performance at minimum cost in future commercial installations. The boiler interface, coal storage, preparation and feeding, stack gas cleanup, parasitic power, auxiliary oil and gas fuel, combustor air and water cooling were redesigned. A total of 63 days of testing were planned for this phase of the project. Due to the excellent performance of the combustor facility, a total of 108 days of combustor tests were completed by January 1998. The test results confirmed that the present combustor and facility design is substantially superior to the previous one, both in performance and capital and operating costs. No significant refurbishment of the combustor was required during this test period.

In the past year, the effort has focussed on extending the performance of the combustor in the areas of increased reduction of NO_x emissions and in co-firing of coal with other fuels, such as biomass. A novel post combustion NO_x control process was tested on the 20 MMBtu/hr combustor facility. When combined with staged combustion, it achieved the low NO_x levels quoted above. This process was also successfully tested on two utility boilers.

Tests on co-firing of agricultural biomass with coal were successfully implemented on the 20 MMBtu/hr combustor.